Blockchain Building Blocks

FinTech

Lesson 18.3

Class Objectives

By the end of this unit, you will be able to:

01 Explain the most popular consensus algorithms and the tradeoffs between each.

02 Create a genesis block using puppeth.

03 Initialize geth nodes using a genesis.json.

04 Run and connect geth nodes together.

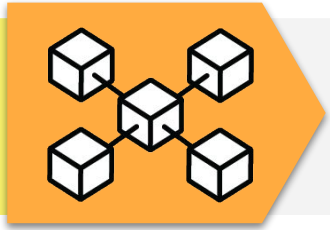
05 Build a blockchain network and produce blocks.

06 Send a transaction on your local network.

Blockchain Skill Check

Let’s refresh a bit on the data structure of a blockchain.

What does the “chain” in blockchain refer to?

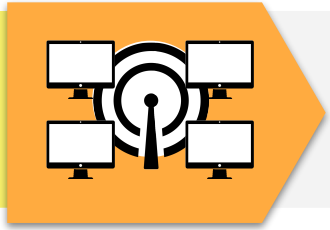


The chain of hashes that link each block to the previous.

What is a digital signature?

A message that you can validate the integrity of and authenticity of cryptographically.

What is a node?



A participant in the network that maintains a full copy of the blockchain.

Building a Blockchain

Building a Blockchain

What we are going to do today?

01

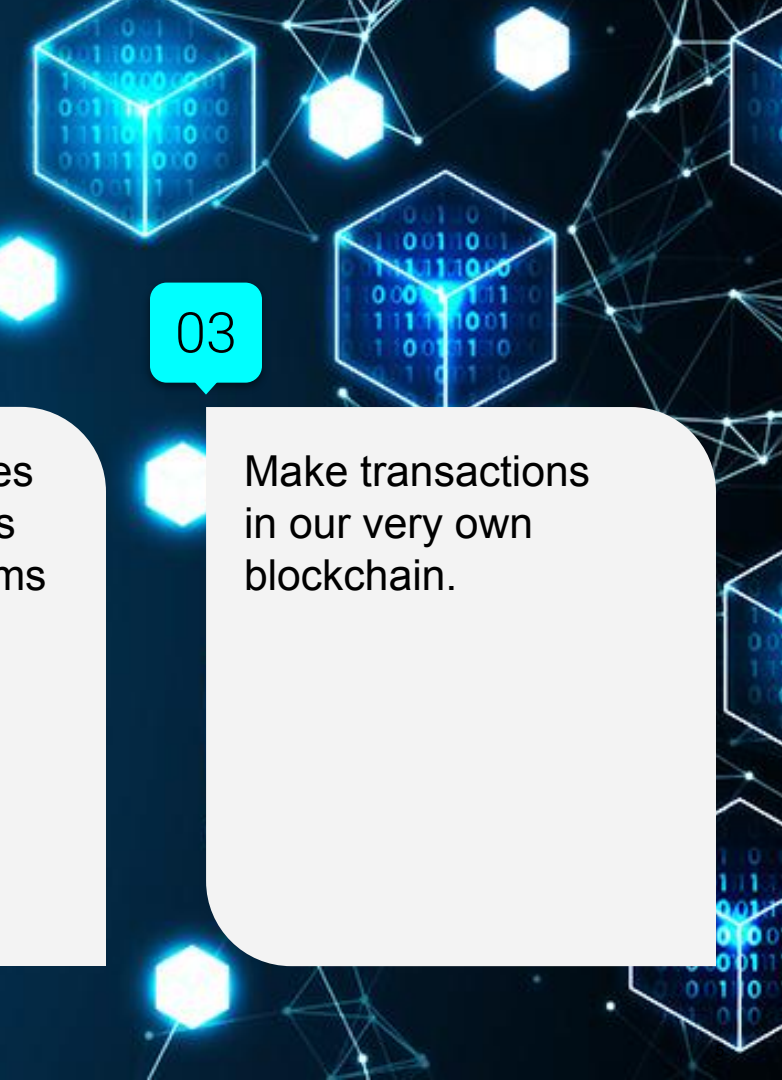
Build a blockchain from scratch!

02

Learn the differences between the various consensus algorithms available.

03

Make transactions in our very own blockchain.



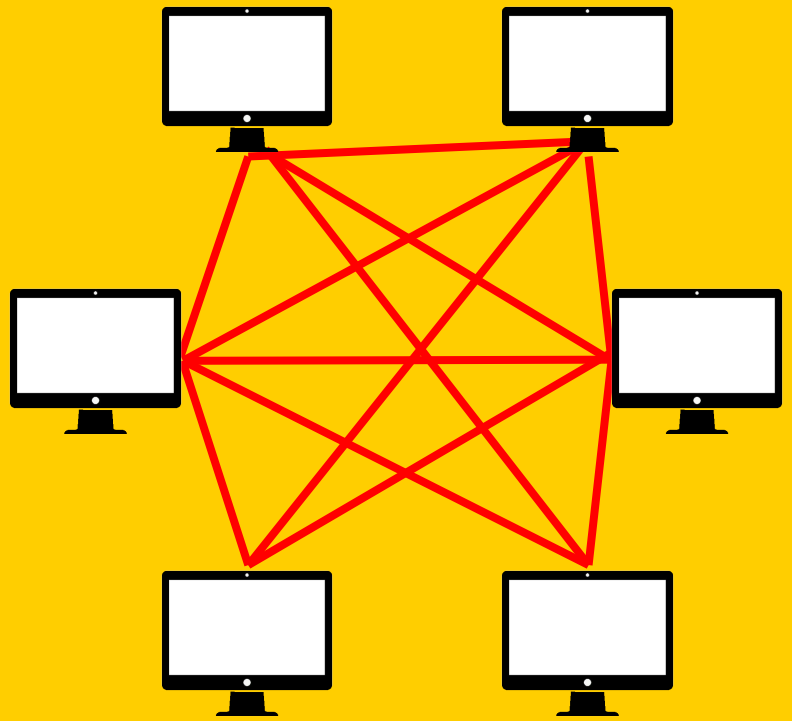
Consensus Algorithms

Consensus Algorithms

In a decentralized system, you cannot trust the participants in the network.

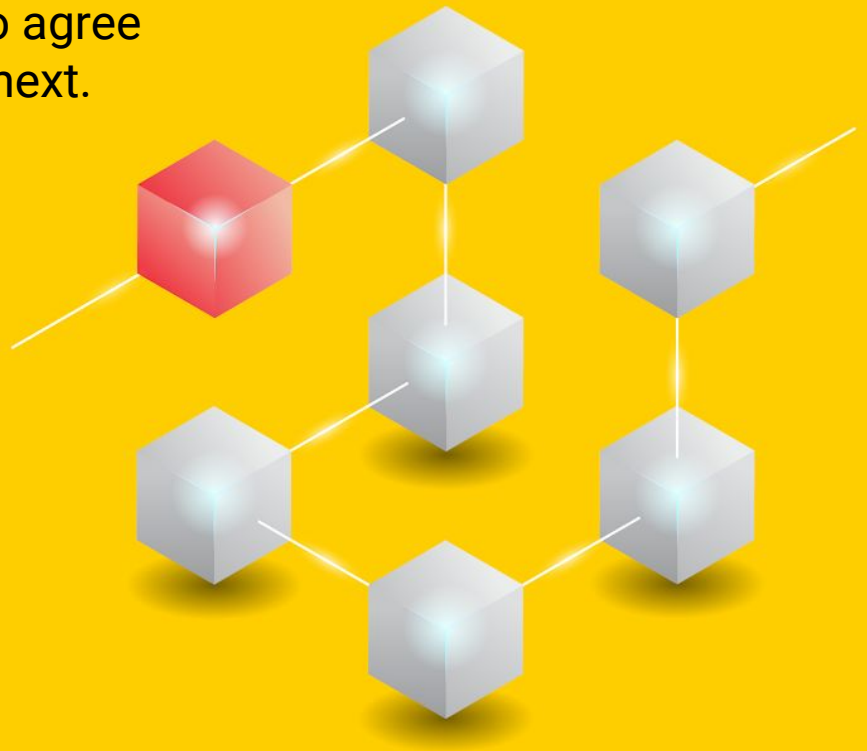
It's a database that can be written to by anyone, which means special rules must be in place to prevent the database from being modified in a malicious way. This is where something called a **"Consensus Algorithm"** comes into play.

Decentralized Database



Consensus Algorithms

The main purpose of a consensus algorithm in blockchain is to get the entire network to agree on which block gets added to the chain next.



Consensus Algorithms

Let’s discuss the three most popular algorithms relevant to the blockchain.

01

Proof of Authority (PoA)

02

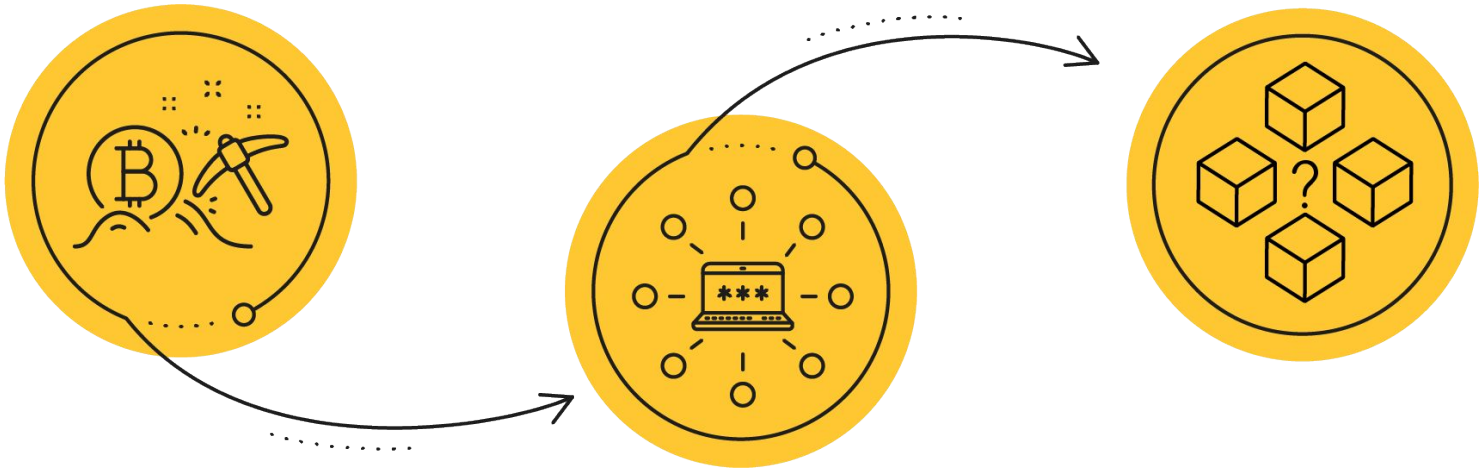
Proof of Work (PoW)

03

Proof of Stake (PoS)

Consensus Algorithms

Proof of Authority (PoA)



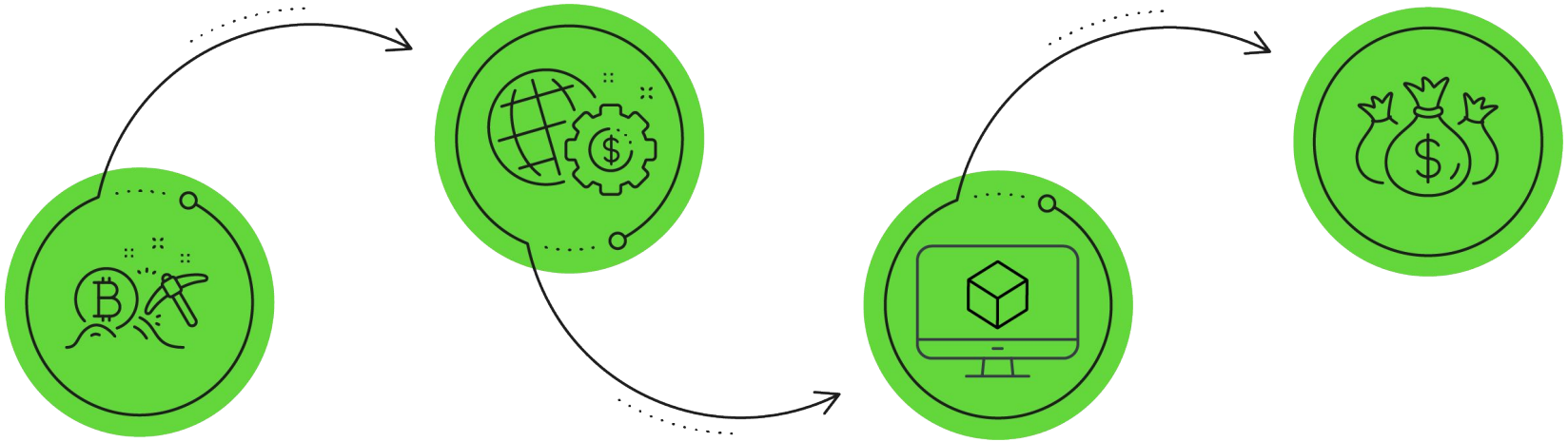
Allows only specific addresses to mine/produce blocks in the network

A centralized but cheap algorithm mainly used to power test networks

Never used in production of mainnet blockchains, only for development and testing in testnet blockchains

Consensus Algorithms

Proof of Work (PoW)



The most popular algorithm in blockchain currently. This is what Bitcoin came out with, and where the term “mining” comes from.

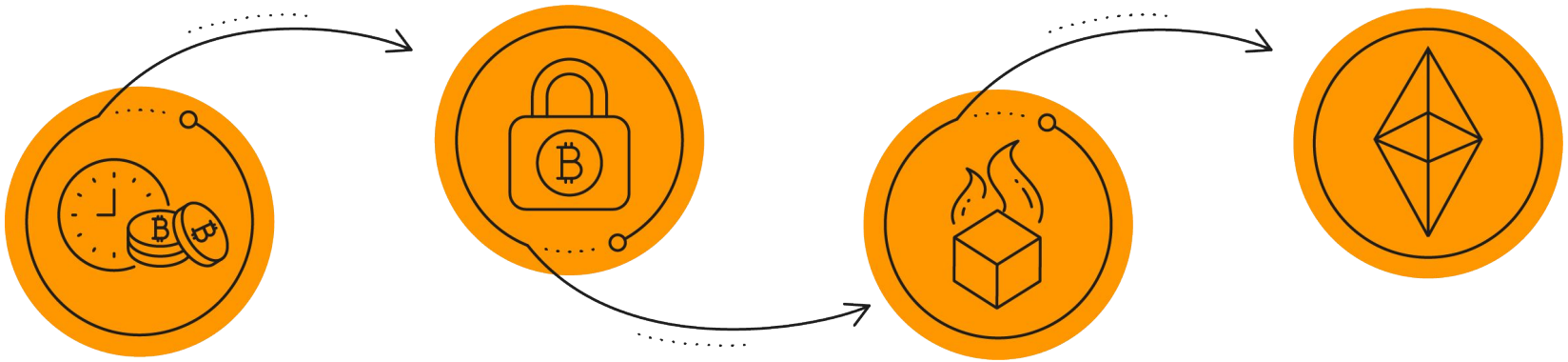
The act of converting computing power that costs real-world energy and money into a block with transactions in it.

The block is then submitted to the network for confirmation, and the block with the most work put into it gets added.

This is a very secure algorithm, but it’s the most expensive in terms of resources. This is its biggest criticism.

Consensus Algorithms

Proof of Stake (PoS)

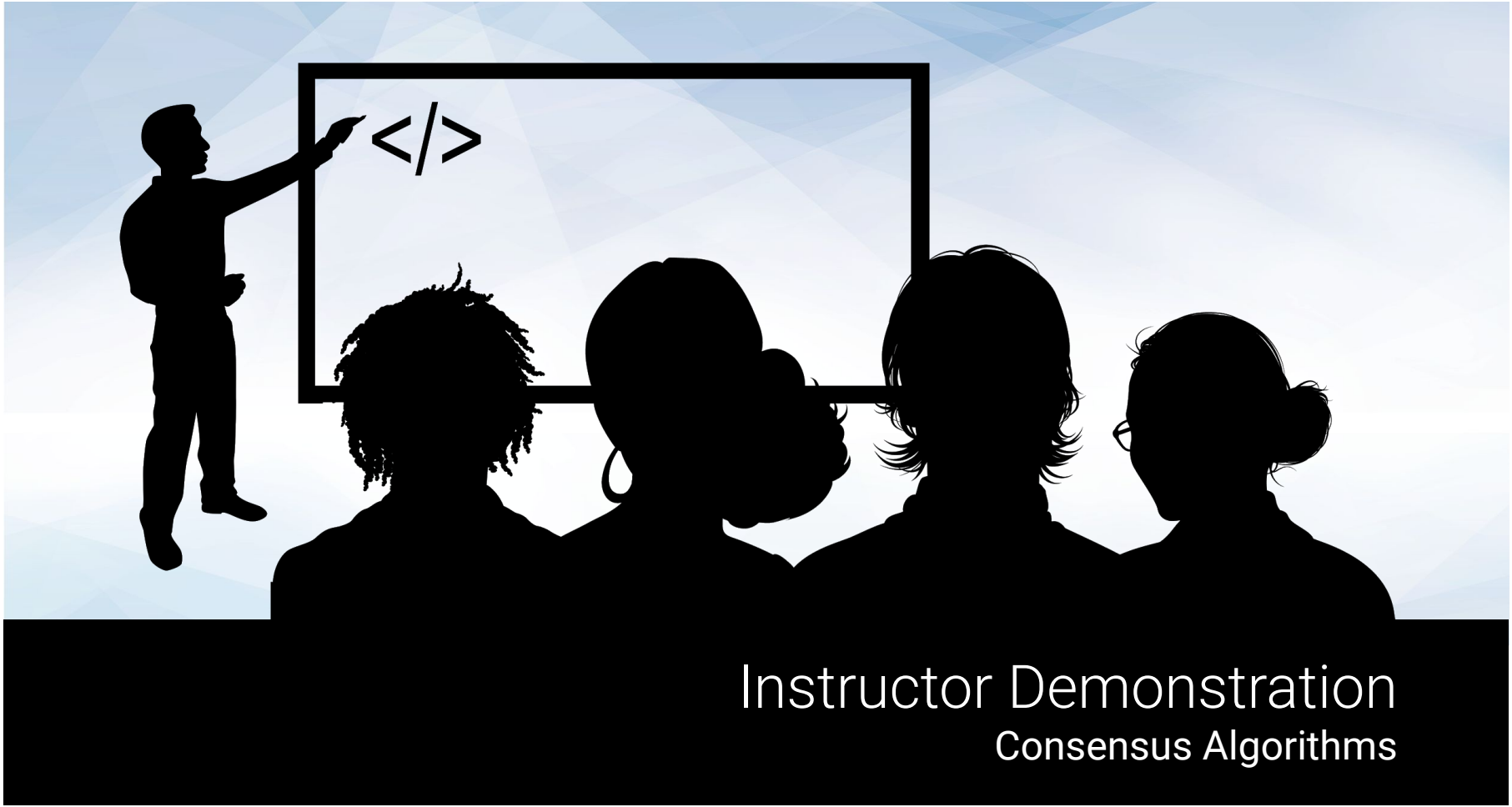


Very similar to PoW, only instead of contributing computational power, you “stake” some of the cryptocurrency for a period of time. Once past a minimum staking interval, you can then submit blocks to the rest of the network for confirmation.

“Staking” your coins means to lock them in a transaction that proves to the rest of the network that you are willing to "put your money where your mouth is" in order to be trusted to make blocks.

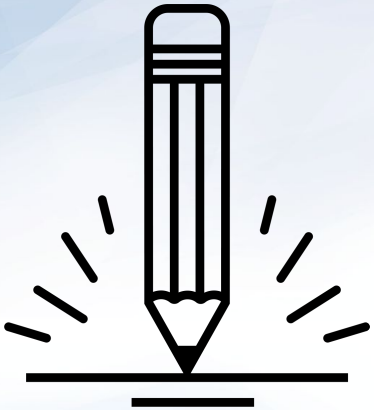
The biggest criticism is the "nothing at stake" problem, where block producers have nothing to lose for producing alternative versions or histories of the blockchain. Some versions of this algorithm include punishing cheaters by burning their stakes and not letting them get it back.

Despite this concern, much of the blockchain community is moving toward variations of PoS, including Ethereum.



Instructor Demonstration

Consensus Algorithms



Activity: Turn and Teach Consensus Algorithms

In this activity, you will turn and teach the three consensus algorithms just covered.

Suggested Time:
10 Minutes

Time’s Up! Let’s Review.

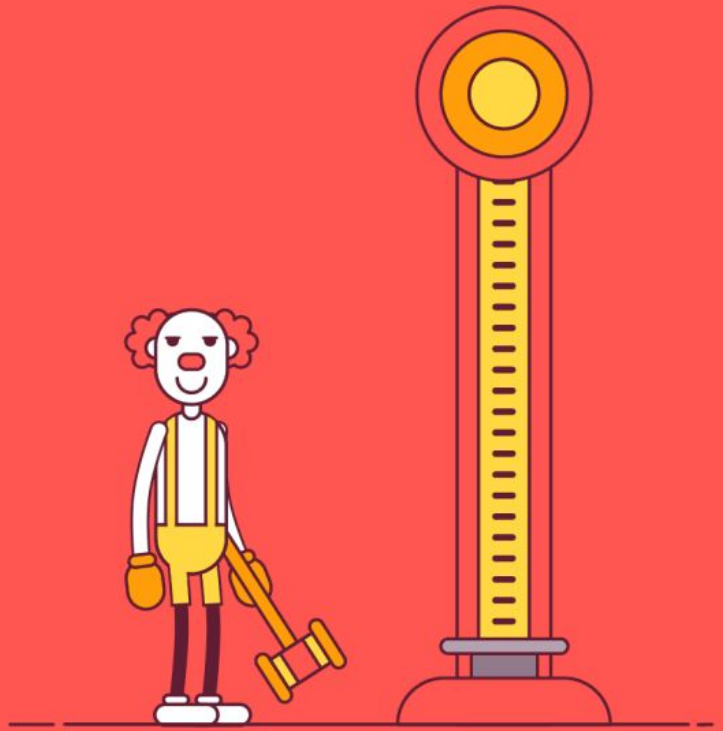
Activity Review: Consensus Algorithms

What is the biggest strength of

01 **Proof of Work**

02 **Proof of Stake**

03 **Proof of Authority**



(Strength Training)

Activity Review: Consensus Algorithms

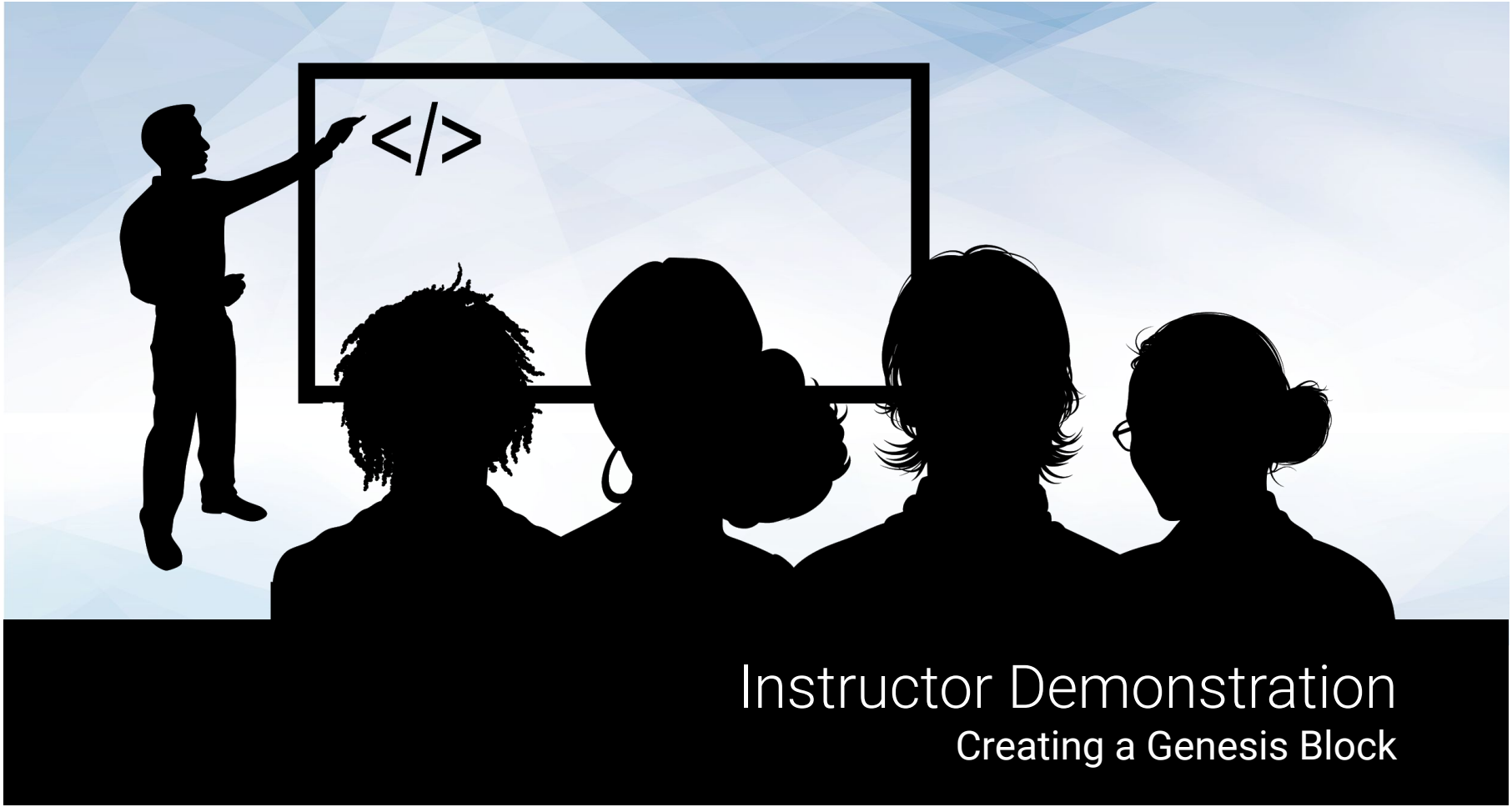
What is the biggest weakness of

01 **Proof of Work**

02 **Proof of Stake**

03 **Proof of Authority**

(Weakness)



Instructor Demonstration

Creating a Genesis Block

Creating a Genesis Block

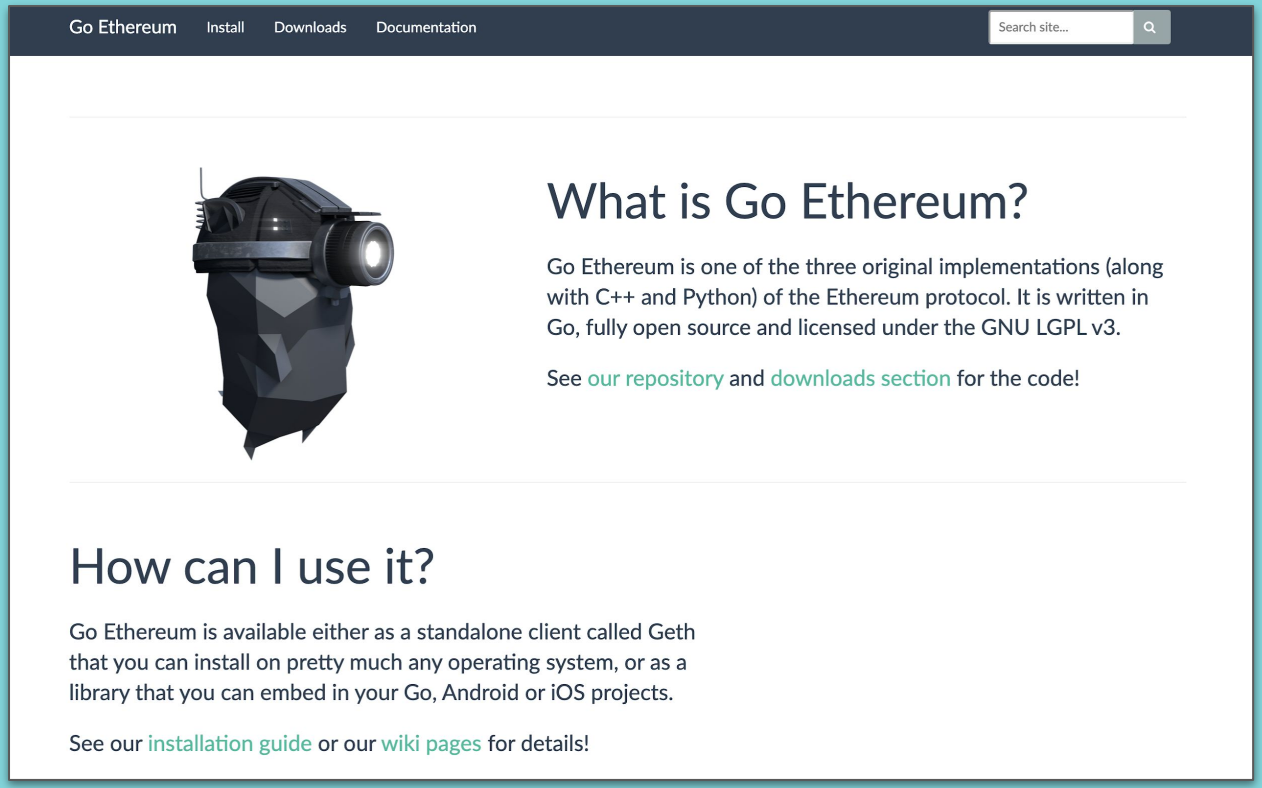
Today we are going to build our Ethereum blockchain.

We will start building the first block of the chain known as **Genesis Block.**

Introducing Go Ethereum

Creating a Genesis Block

The Go Ethereum tool is one of the three original implementations of the Ethereum protocol.

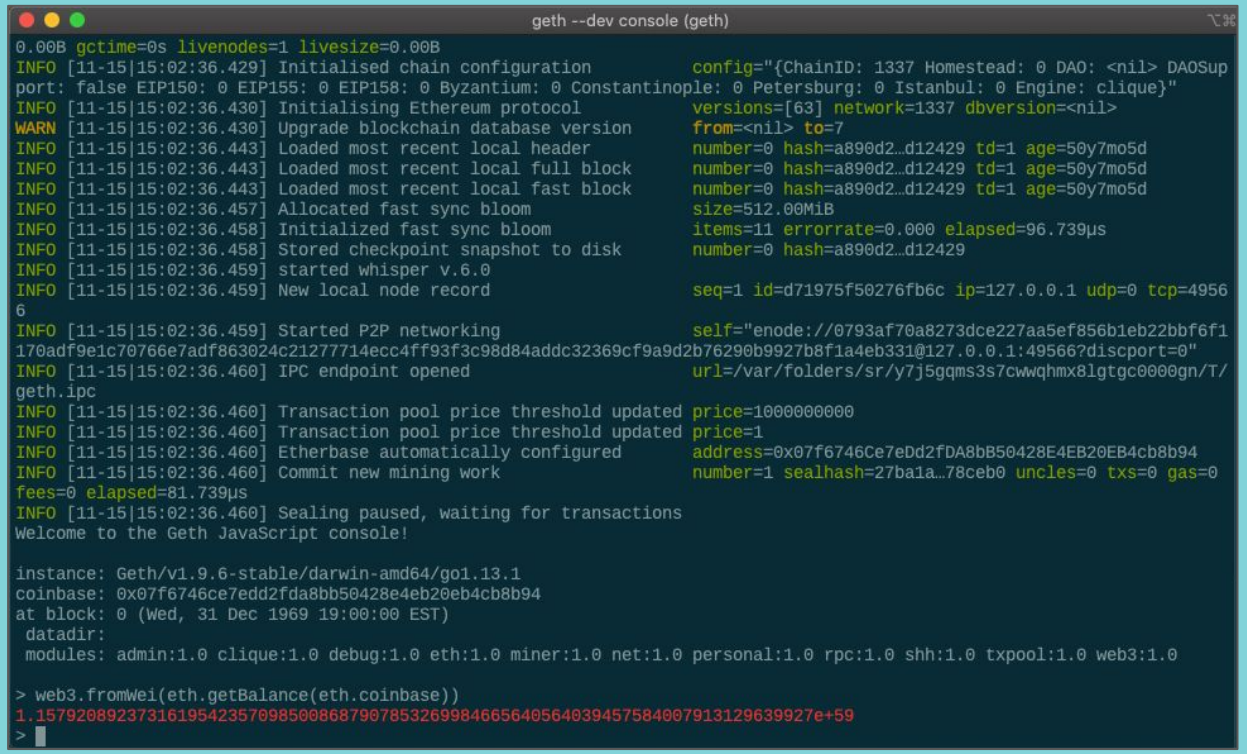


(geth.ethereum.org/)

Creating a Genesis Block

We will use the Go Ethereum tool via the `geth` command-line tool.

geth is the official Ethereum node software used to initialize, run and manage Ethereum nodes.



Creating a Genesis Block

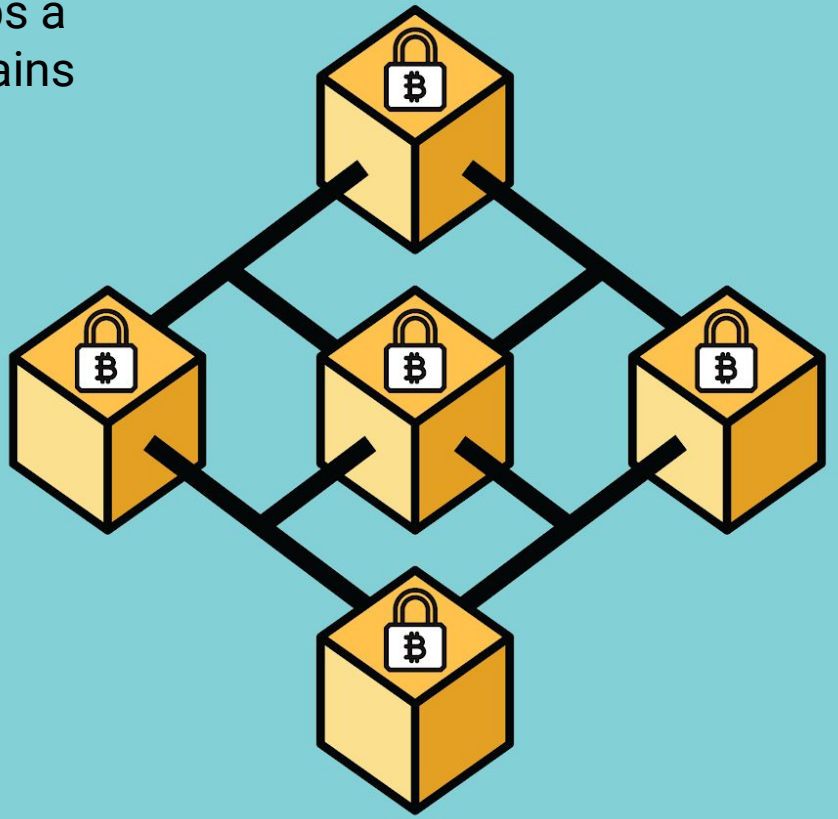
The Go Ethereum tool is written in the Go programming language, fully open-source and licensed under the GNU LGPL v3.

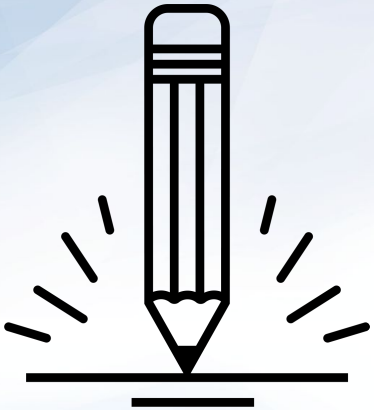
Don't worry, you don't need to learn Go!
You just have to know that it's super fast and has a cute mascot called Gogopher.

Do You Remember What a Node is?

Creating a Genesis Block

A participant of the network that keeps a full copy of the blockchain and maintains the consensus rules of the network.





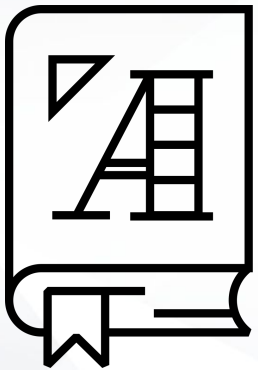
Activity: Creating a Genesis Block

In this activity, you will create your own genesis configuration.

Suggested Time:
10 Minutes

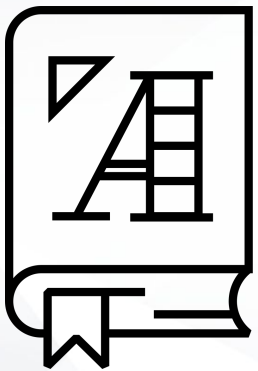
Time’s Up! Let’s Review.

What is Important About the Genesis Block?



It contains the **initial rules** for the blockchain network, like consensus algorithm, prefunded accounts, etc.

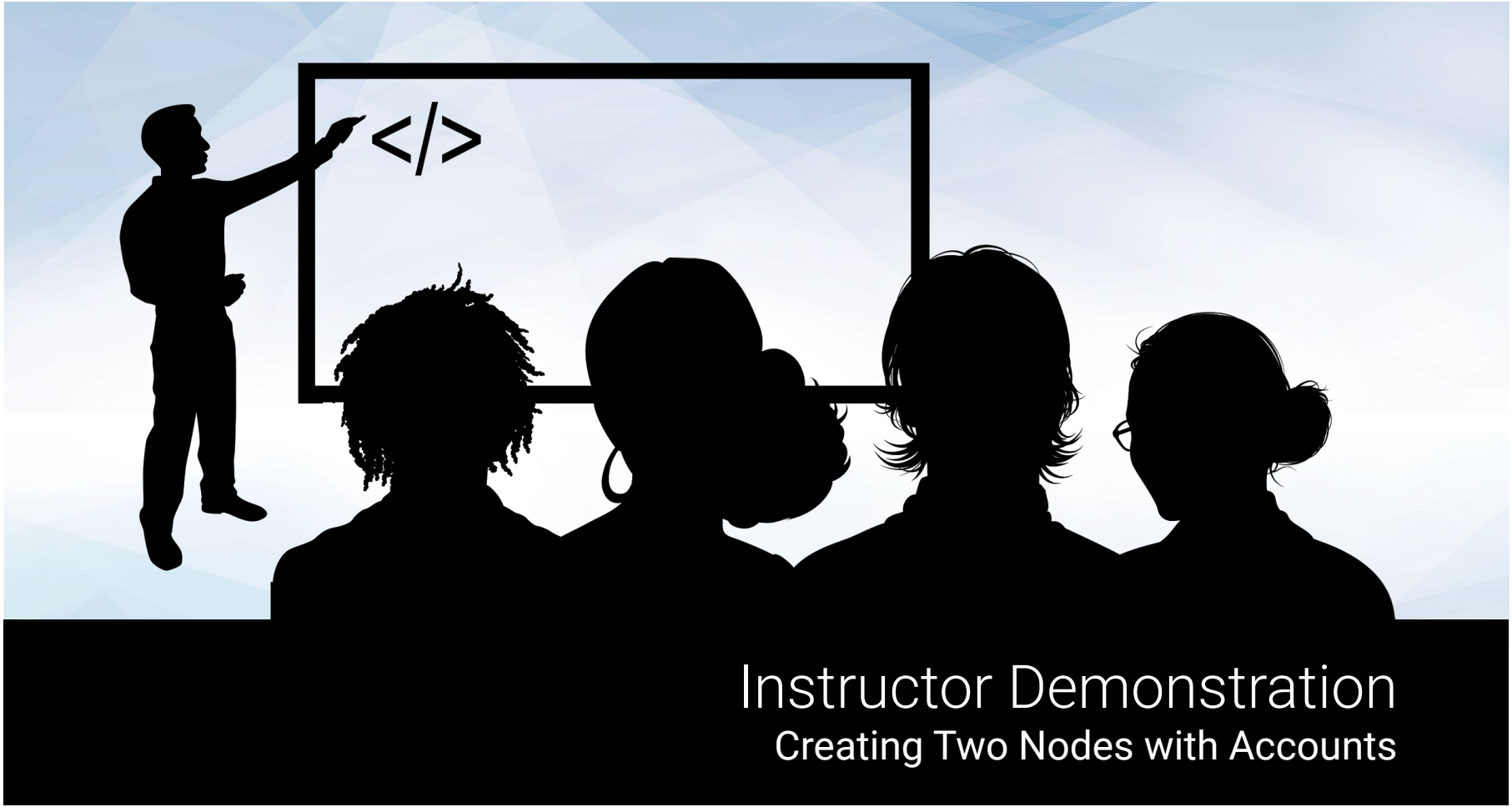
What is the Point of Prefunding Accounts in the Genesis Block?



So that we have some **cryptocurrency** to test with right away; otherwise, we'll have to mine it manually (time-consuming).

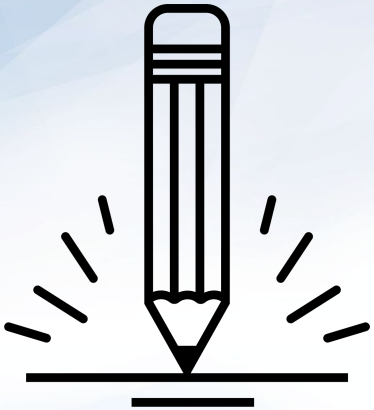
Since We Chose Proof of Work, What Mechanism are We Using to Create New Blocks?

Mining



Instructor Demonstration

Creating Two Nodes with Accounts



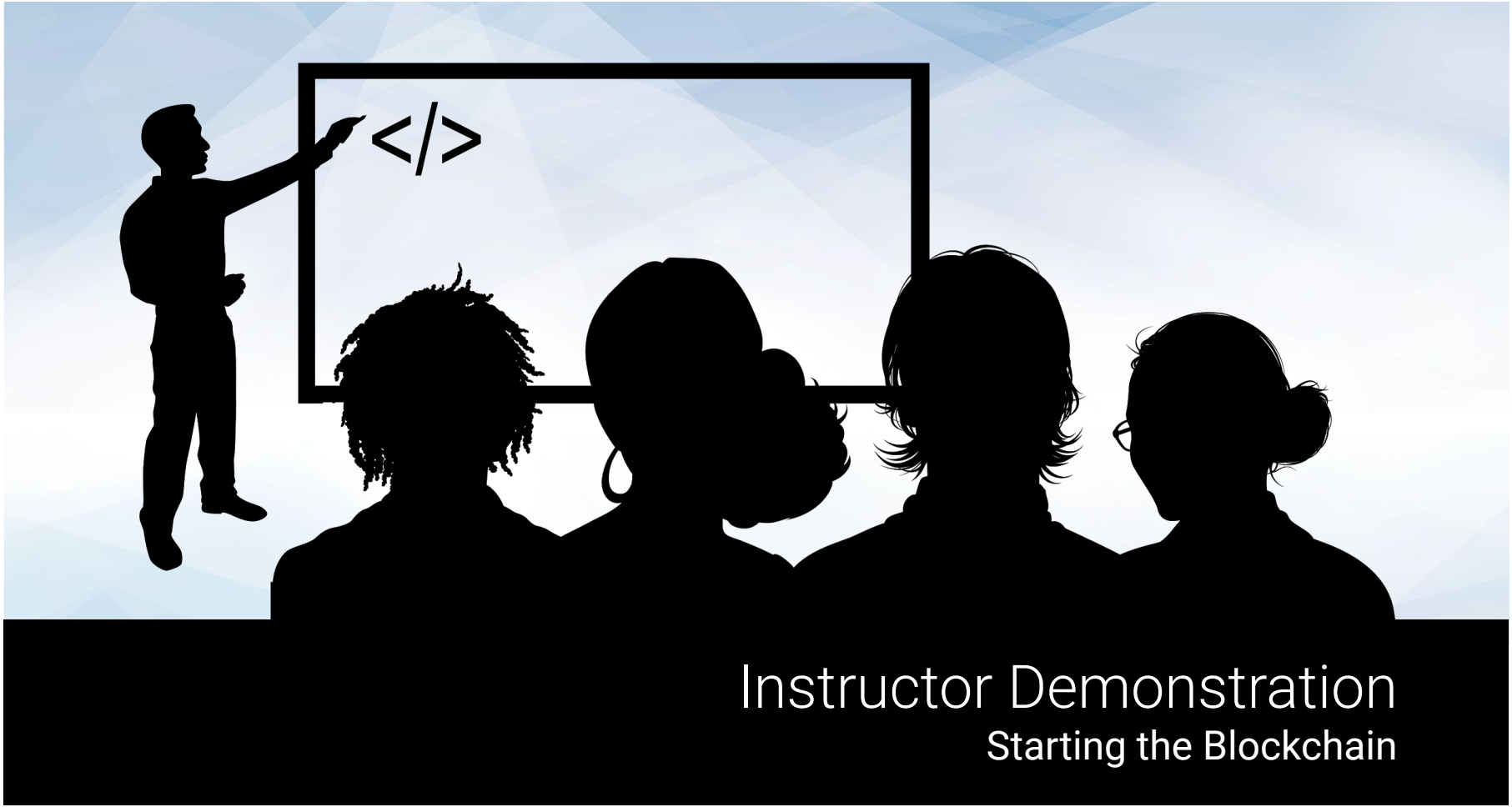
Activity: Creating Two Nodes with Accounts

In this activity, you will create your own nodes and accounts for your custom blockchain network.

Suggested Time:
15 Minutes

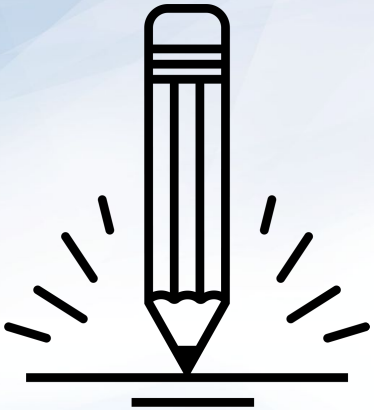
Time’s Up! Let’s Review.


Break



Instructor Demonstration

Starting the Blockchain

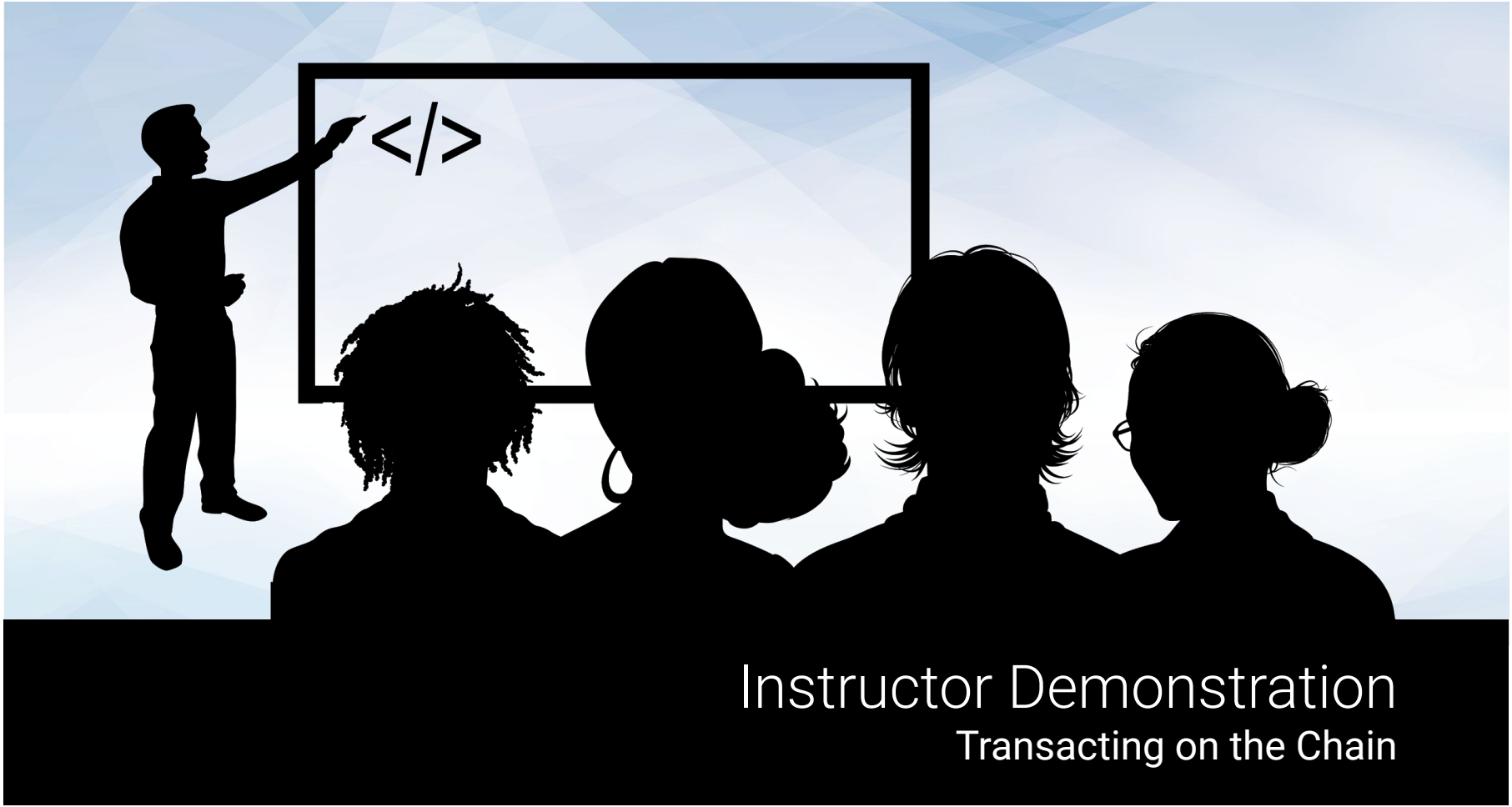


Activity: Bringing the Blockchain to Life

In this activity, you will launch your own chains using the same techniques presented in the demo.

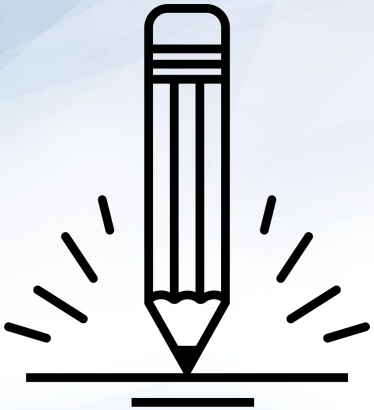
Suggested Time:
15 Minutes

Time’s Up! Let’s Review.



Instructor Demonstration

Transacting on the Chain

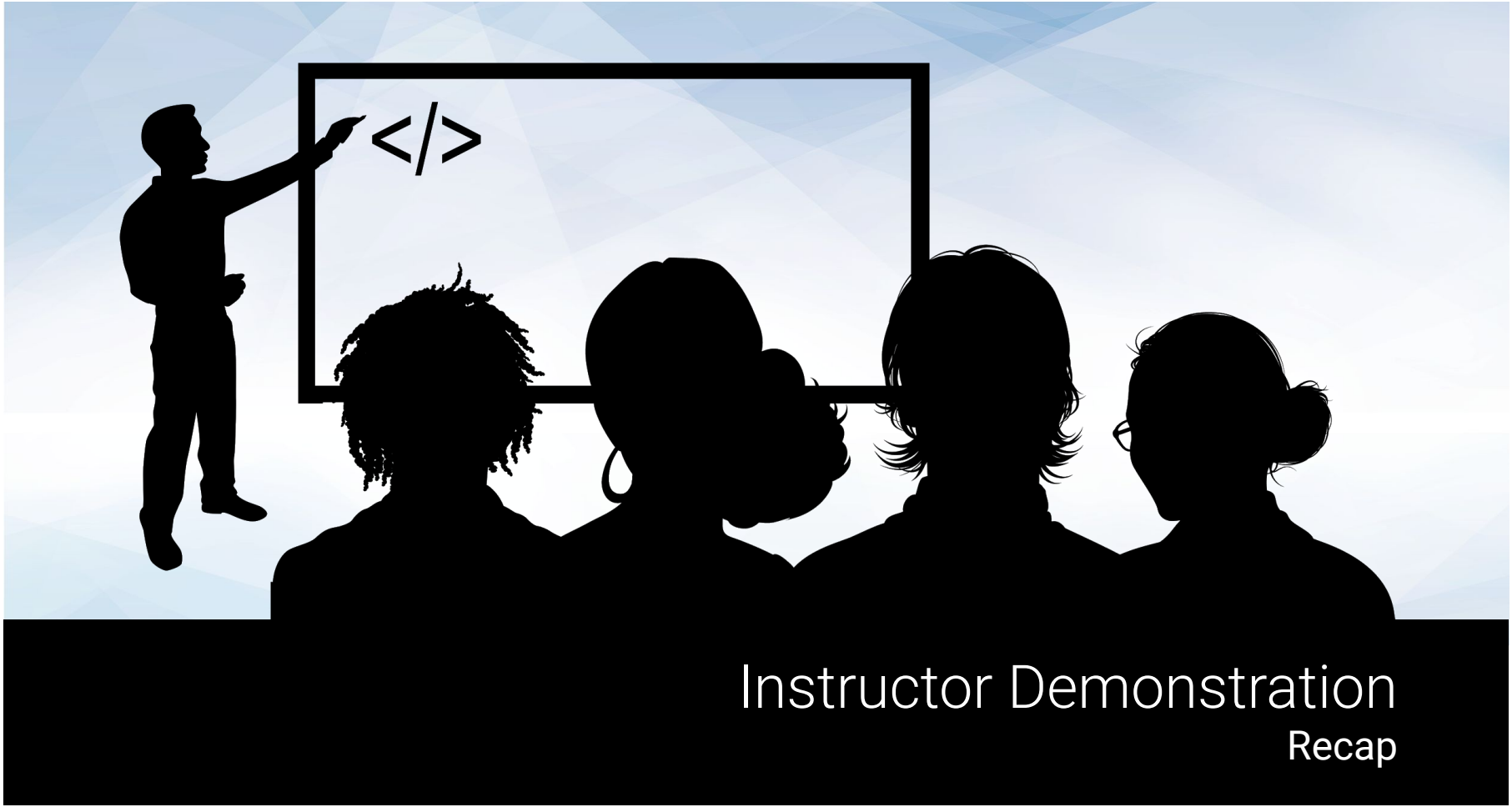


Activity: Transacting on the Chain

In this activity, you will connect MyCrypto to your chain and send a transaction!

Suggested Time:
15 Minutes

Time’s Up! Let’s Review.



Instructor Demonstration

Recap

Questions?


The End